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(56) Documents Cited

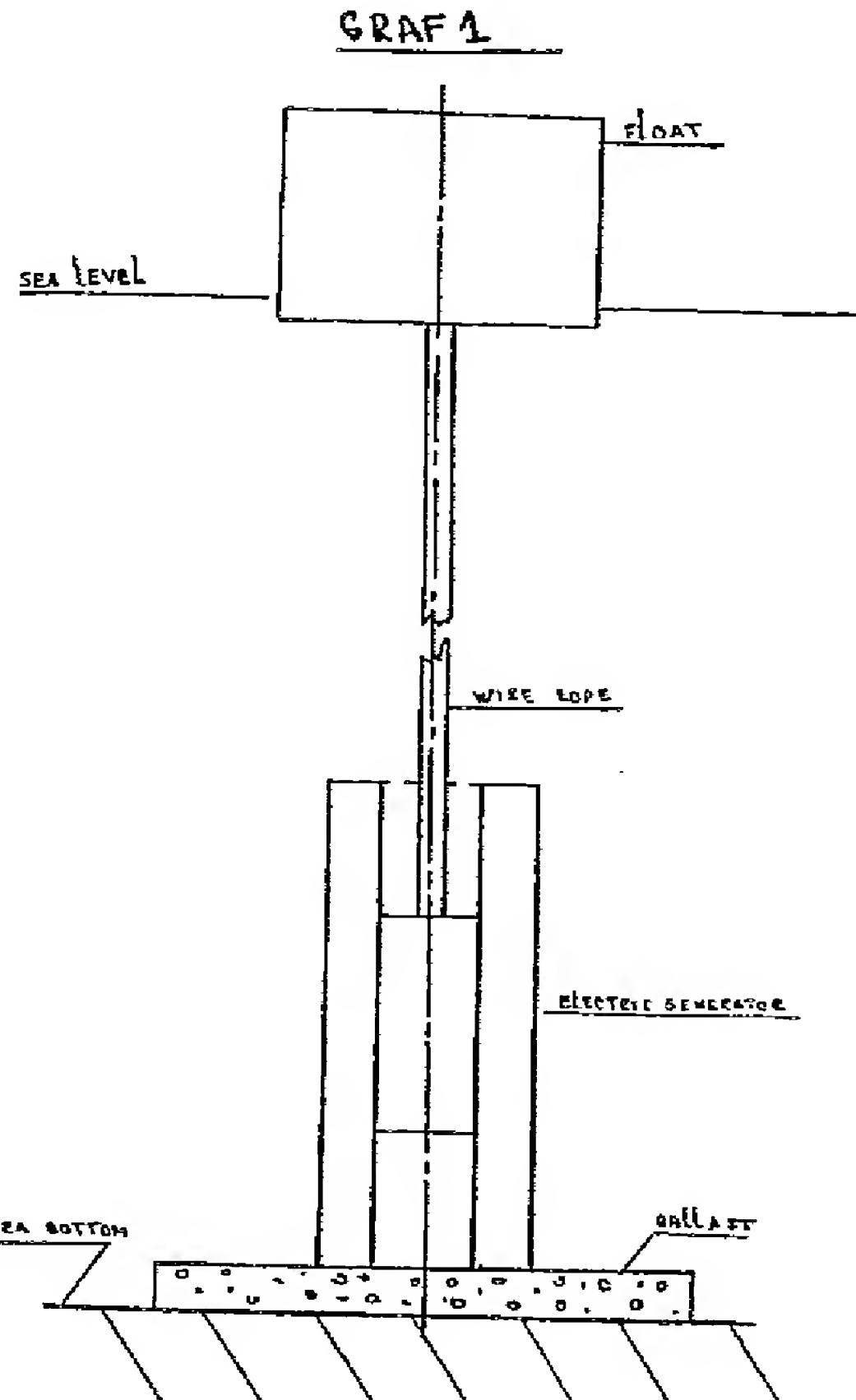
GB 2084259 A      GB 2062113 A      GB 2015657 A  
GB 1449048 A      EP 0297662 A      US 4492875 A  
US 4260901 A      US 4191893 A

(58) Field of Search

UK CL (Edition M ) F1S  
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ONLINE DATABASE : WPI

## (54) Electrical power generation from waves

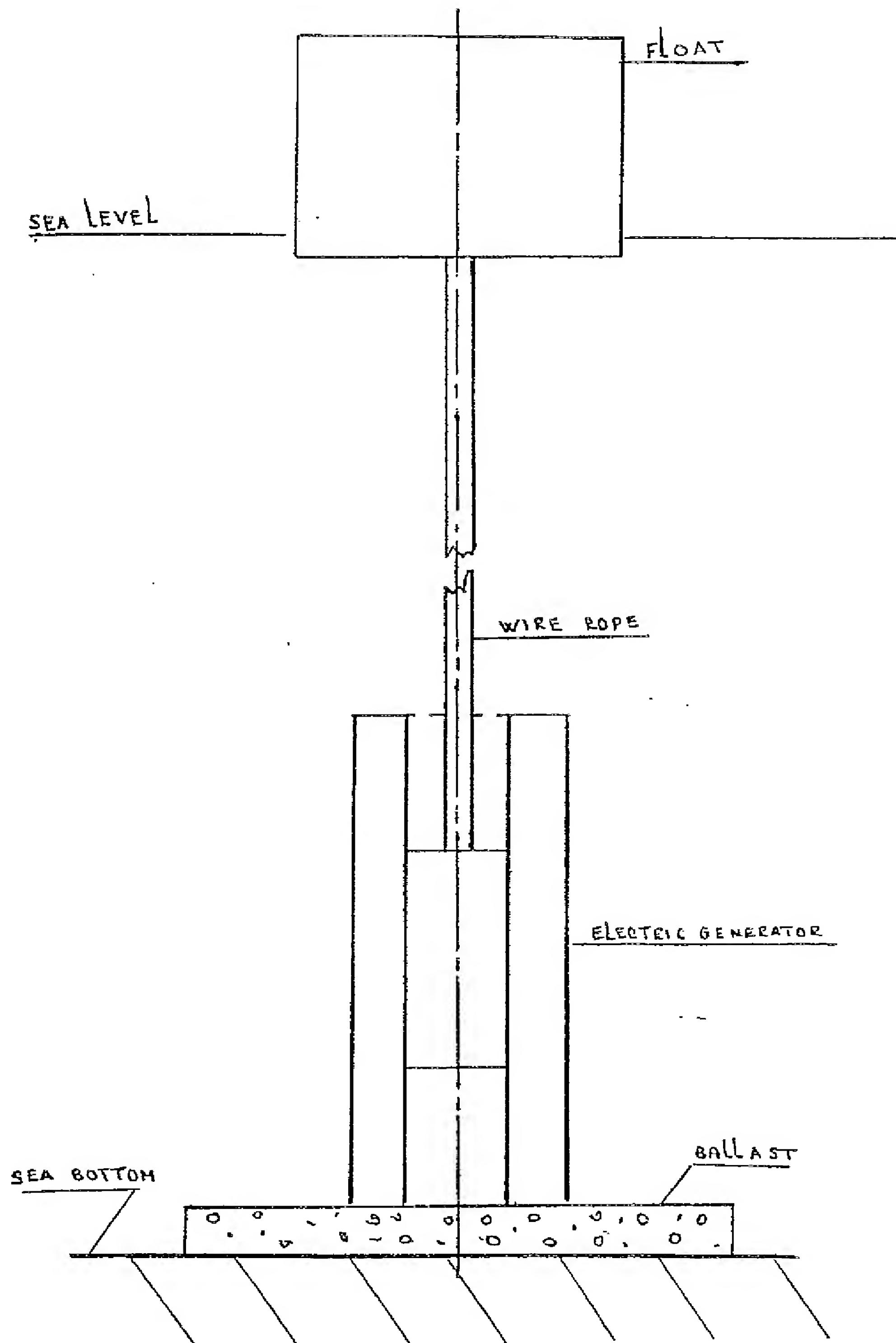
(57) An Electrical Power Station using wave energy has a float which rests on the surface of the water, and an electricity generator which is on the sea-bed. The float is attached to the generator by a strong cable. The generator consists of a stator and a linearly reciprocable "rotor". In the "rotor" there is a permanent strong magnet which moves up and down by the action of the sea waves on the float. The stator is a multturn winding, fixed to the sea bed. When the rotor moves into the stator the rotor's magnetic field creates an electric current which is transmitted to shore by electric cable.



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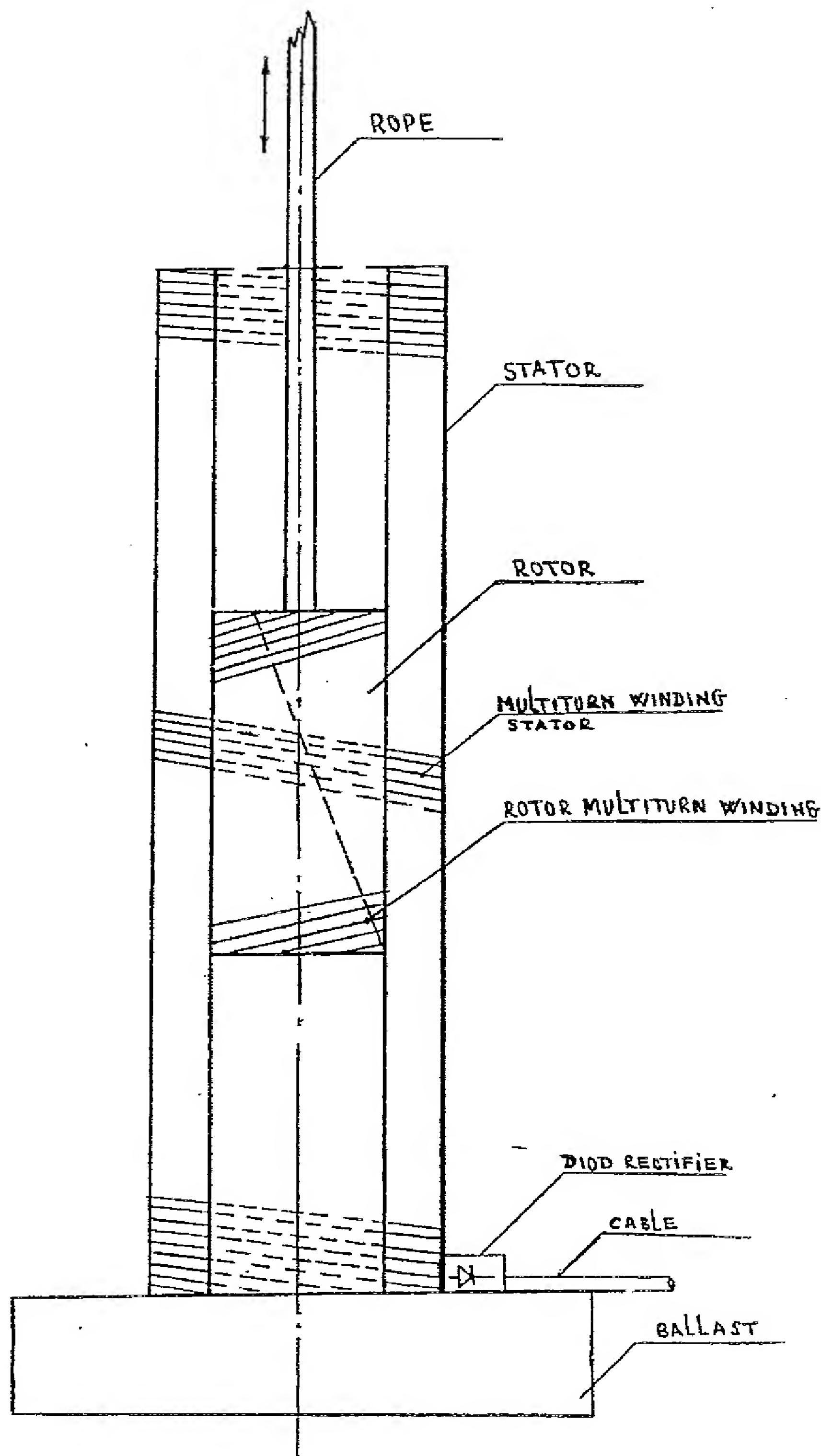
GRAF 1

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## ELECTRIC POWER STATION USING SEA WAVE ENERGY

1. The invention belongs to the field of energy converters, in particular to electric power stations which convert the mechanical energy of sea waves to electric energy.
2. The design of a wave-driven electric power station using the energy of sea waves is well known. However such power stations require high expenditure to build; they change the shape of the coast and the seabed; the design is complex, as is maintenance.
3. The aim of the invention is to build a simple and effective design using sea waves to obtain electric energy.

Wave-driven electric power station: W.E.P.S.

The device consists of 2 main parts:

- a. a float - which is on the surface of the water.
- b. an electric generator - which is on the sea bed.

When sea waves are present they cause periodic lifting and falling of the float. An electric generator is attached to the float by a cable (wire rope). FIG.1

The electric generator device consists of a stator and a rotor.

The rotor is a short-circuited winding. The winding wire is wound onto a permanent magnet.

The magnet is cylindrical.

The stator is a solenoid or a multiturn winding. The solenoid is cylindrical. Inside the cylinder is the rotor. The rotor is the mobile part of the generator. The rotor can only move up and down.

Operation: FIG 2.

4. By means of a wire rope the rotor is suspended from the float. The rotor can move freely up and down inside the stator winding. The rotor's central position is at the moment when there are no sea waves. The weight of the rotor is balanced by the lift of the float. When sea waves are present the float-rotor system is in oscillation. The rotor makes vertical movements. The amplitude of this movement is equal to the amplitude of the waves.

5. When the rotor moves its magnetic field cuts the stator winding turns. An electromotive force (EMF) occurs in the stator. A mutual induction process takes place between the two windings of the stator and rotor. When the rotor moves in the stator an electric field is created and an electric current occurs. The electric energy obtained is transmitted by cable to the shore for use.

6. When the wave reaches its maximum height the process is repeated in reverse order. The magnetic field tries to prevent the rotor from moving downwards under the action of the rotor's weight. In the stator winding the electromagnetic field changes to the opposite direction.
7. Therefore there is a full-wave diode rectifier at the stator winding output, as a result of which the electric power station produces direct current.
8. Electric power stations such as this can be connected together like electric batteries so as to obtain higher voltage and current.

## ELECTRIC POWER STATION USING SEA WAVE ENERGY

Claims.

- i. This unit is designed to convert the mechanical energy of sea-waves to electrical energy without intermediate steps. It consists of a float which rests on the surface of the water which is connected by cable to an electricity generator which lies on the sea bed.
- ii. The Electrical Power Station, as claimed in claim i. wherein means an electricity generator consisting of a stator constantly fixed to the sea bed, and a rotor.
- iii. The electrical power station as claimed in claims i. and ii. wherein means that the rotor is a short-circuited winding wire wound onto a permanent cylindrical magnet which is attached to the float by a cable and moves by the up-and down wave action of the float.
- iv. The Electrical Power Station as claimed in claims i.,ii,iii, wherein means that the stator is a cylindrical solenoid inside which the rotor makes vertical movements.
- v. The Electrical Power Station as claimed in claim iii. or claim iv. wherein means that when the rotor moves into the stator, its magnetic field cuts the stator's winding turns and an electric current is created in the stator which is transmitted to shore by cable.

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| Relevant Technical Fields  |  | Search Examiner<br>C B VOSPER  |
| (i) UK Cl (Ed.M)   | F1S                                    |  |
| (ii) Int Cl (Ed.5)   | F03B 13/00, 13/12, 13/14, 13/16, 13/18 | Date of completion of Search<br>7 JANUARY 1994                                 |
| Databases (see below)  |  | Documents considered relevant<br>following a search in respect of<br>Claims :- |
| (i) UK Patent Office collections of GB, EP, WO and US patent specifications. |  | 1 TO 5   |
| (ii) ONLINE DATABASE WPI   |  |  |

Categories of documents

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| Y: | Document indicating lack of inventive step if combined with one or more other documents of the same category. | E: | Patent document published on or after, but with priority date earlier than, the filing date of the present application. |
| A: | Document indicating technological background and/or state of the art.   | &: | Member of the same patent family; corresponding document.   |

| Category | Identity of document and relevant passages |  | Relevant to claim(s) |
|----------|--|--|----------------------|
| Y        | GB 2084259 A                               | (KAWASAKI) Figures 1, 5 - show surface float (36) transmitting drive to sea-bed mounted generator (24) via cable (34)                  | 1 to 5               |
| Y        | GB 2062113 A                               | (ORTEGA) Figure 1 shows surface float transmitting drive to power output via a cable   | 1 to 2               |
| Y        | GB 2015657 A                               | (EVANS) Figures 1, 3, page 1 line 100 to page 2 line 27 shows float connected by a cable to a generator having a stator on the sea bed | 1 to 5               |
| Y        | GB 1449048                                 | (WOODBRIDGE) whole document - shows surface float operated magnet having field that cuts stator winding turns                          | 1 to 5               |
| Y        | EP 0297662                                 | (ELEKTRICITEIT) Figure 1 column 3 lines 8 to 21  | 3 and 4              |
| Y        | US 4492875                                 | (UNITED) whole document, shows surface mounted float, cable and magnetic rotor cutting windings of a stator                            | 1 to 5               |
| Y        | US 4260901                                 | (WOODBRIDGE) Figure 1, column 2 lines 58 et seq - shows surface float operated magnet having a field that cuts stator winding turns    | 1 to 5               |
| Y        | US 4191893                                 | (UNITED) whole document - shows generator features per se  | 3, 4, and 5          |

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).